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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.            | CONFIRMATION NO. |
|--|-------------|----------------------|--------------------------------|------------------|
| 09/826,674   | 04/05/2001  | Saket Chadda         | 34759,9800                     | 3534             |
| 7590   | 01/21/2004  |                      |                                |                  |
| Snell & Wilmer, L.L.P.<br>One Arizona Center<br>400 East Van Buren<br>Phoenix, AZ 85004-2202 |             |                      | EXAMINER<br>DEO, DUY VU NGUYEN |                  |
|  |             |                      | ART UNIT<br>1765               | PAPER NUMBER     |

DATE MAILED: 01/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                               |                               |
|------------------------------|-------------------------------|-------------------------------|
| <b>Office Action Summary</b> | Application No.<br>09/826,674 | Applicant(s)<br>CHADDA ET AL. |
|                              | Examiner<br>DuyVu n Deo       | Art Unit<br>1765              |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 28 November 2003.

2a) This action is FINAL.                    2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) *See Continuation Sheet* is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) Claim(s) \_\_\_\_\_ is/are allowed.

6) Claim(s) 1-3,5-10,14-16,21-24,27-29,31-36,52-54,56-61,65-67,72-80,82-87,91-93 and 98-102 is/are rejected.

7) Claim(s) \_\_\_\_\_ is/are objected to.

8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. §§ 119 and 120

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

13) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) The translation of the foreign language provisional application has been received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

#### Attachment(s)

1) Notice of References Cited (PTO-892)                    4) Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)                    5) Notice of Informal Patent Application (PTO-152)  
 3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.                    6) Other:

Continuation of Disposition of Claims: Claims pending in the application are 1-3,5-10,14-16,21-24,27-29,31-36,52-54,56-61,65-67,72-80,82-87,91-93 and 98-102.

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## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-3, 5-10, 14-16, 21-24, 27-29, 31-36, 52-54, 56-61, 65-67, 72-80, 82-87, 91-93, 98-102 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification doesn't teach the limitation establishing a temperature at said contact area by heating and cooling said polishing solution before causing said polishing solution to be distributed to said contact area.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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4. Claims 1, 2, 14, 21, 24, 27, 28, 52, 53, 65, 75, 78, 79, 91 are rejected under 35

U.S.C. 103(a) as being unpatentable over Kondo et al. (JP 11-135466), Beardsley et al. (US 6,135,865), and Vanell et al. (US 5,945,346).

US patent 6,117,775 is considered as the correct translation of JP patent 11-135466 and is used here for the rejection. A translation will be provided upon applicant's request.

Kondo teaches a polishing method for removing a metal surface wherein the metal surface is oxidized to form a thin removable oxide film (claimed kinetic removal mechanism for removal of the metal surface is characterized by a formation step for formation of a removable surface film) comprising: causing a wafer to contact a polishing pad and rotating the wafer and the pad (claimed abrasive step or causing work piece to contact a polishing member while effecting relative motion between them), supplying a slurry having less than 1 wt% of polishing abrasive between the wafer and the pad (col. 6, line 5-16, line 57-68; col. 11, line 60-col. 12, line 3).

Unlike claimed invention, Kondo doesn't describe supplying slurry through a plurality of pores in the pad and through at least one pore in the platen connected to the pad. Beardsley teaches a CMP apparatus wherein he teaches supplying the slurry through a porous pad and through holes formed in the platen connected to the pad (claimed at least one pore formed in the platen) (col. 3, line 55-63; col. 5, line 50-68; figure 4, 5). It would have been obvious for one skilled in the art to modify Kondo's method in light of Beardsley's slurry distributing system because Beardsley teaches that this slurry distributing system is inexpensive and uncomplicated and would distribute slurry more uniformly on the pad to have an uniform polishing action (col. 1, line 54-col. 2, line 13).

Unlike claimed invention, applied prior art doesn't describe establishing the T at the contact area by heating circulating a heated fluid through the heat conductive platen or by heating or cooling the slurry before distributing it to the contact area. Vanell teaches that the chemical reactions are sensitive to the T and the reaction rate typically increases with the T. In the CMP, the T is held within a certain range to control the rate of reaction. He teaches of circulating fluid to heat or cool the platen to control the rate of reaction of the polishing process and also to heat the platen to ensure the chemicals in the slurry have minimum reaction rate when starting a CMP process (col. 9, line 35-col. 10, line 10). It would have been obvious at the time of the invention for one skilled in the art in light of Vanell's teaching of controlling the T of the process to heat or cool the platen and also the slurry in order control the rate of the reaction or to heat the slurry before distributing it to the contact area to ensure the chemicals in the slurry to have a minimum reaction when starting a CMP process.

Referring to claim 24, the friction between the wafer and the polishing member (claimed contact area) while rotating would establish a T at the contact area while polishing or distributing the slurry.

Referring to claims 52 and 78, Kondo discloses the metal to be polished is Cu (col. 6, line 19) and down force is 220 g/cm<sup>2</sup> or 3.13 psi (claimed low-down force pressure). The rate of removal of Cu surface would have to be approximately proportional to the contact pressure since a higher P would increase polishing rate and a lower P would slow down polishing rate.

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5. Claims 1-3, 5, 14, 21, 24, 27-29, 31, 52-54, 56, 65, 75, 78-80, 82, 91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo et al. (JP 11-135466), Sato (US 5,246,525), and Vanell et al. (US 5,945,346).

US patent 6,117,775 is considered as the correct translation of JP patent 11-135466 and is used here for the rejection. A translation will be provided upon applicant's request.

Kondo teaches a polishing method for removing a metal surface wherein the metal surface is oxidized to form a thin removable oxide film (claimed kinetic removal mechanism for removal of the metal surface is characterized by a formation step for formation of a removable surface film) comprising: causing a wafer to contact a polishing pad and rotating the wafer and the pad (claimed abrasive step or causing work piece to contact a polishing member while effecting relative motion between them), supplying a slurry having less than 1 wt% of polishing abrasive between the wafer and the pad (col. 6, line 5-16, line 57-68; col. 11, line 60-col. 12, line 3).

Unlike claimed invention, Kondo doesn't describe supplying slurry through channel or pores formed in the pad and through at least one pore, which formed in a platen and collinear with the channel. Sato describes a polishing apparatus wherein he teaches supplying the slurry through channel 4 formed in the pad and pore 4, formed in the platen and collinear with the channel 4 (figure 1b, 2b, 3b). It would have been obvious to modify Kondo's method in light of Sato's slurry distributing system because Sato shows that slurry can be distributed uniformly on the pad and therefore, would help the polishing of the wafer is more uniform to provide a flat surface (col. 2, line 50-65; summery).

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Unlike claimed invention, applied prior art doesn't describe establishing the T at the contact area by heating circulating a heated fluid through the heat conductive platen or by heating or cooling the slurry before distributing it to the contact area. Vanell teaches that the chemical reactions are sensitive to the T and the reaction rate typically increases with the T. In the CMP, the T is held within a certain range to control the rate of reaction. He teaches of circulating fluid to heat or cool the platen to control the rate of reaction of the polishing process and also to heat the platen to ensure the chemicals in the slurry have minimum reaction rate when starting a CMP process (col. 9, line 35-col. 10, line 10). It would have been obvious at the time of the invention for one skilled in the art in light of Vanell's teaching of controlling the T of the process to heat or cool the platen and also the slurry in order control the rate of the reaction or to heat the slurry before distributing it to the contact area to ensure the chemicals in the slurry to have a minimum reaction when starting a CMP process.

Referring to claim 24, the friction between the wafer and the polishing member (claimed contact area) while rotating would establish a T at the contact area while polishing or distributing the slurry.

Referring to claims 52 and 78, the metal to be polished is Cu (col. 6, line 19) and down force is 220 g/cm<sup>2</sup> or 3.13 psi (claimed low-down force pressure). The rate of removal of Cu surface would have to be approximately proportional to the contact pressure since a higher P would increase polishing rate and a lower P would slow down polishing rate.

6. Claims 6-10, 15, 16, 32-36, 57-61, 66, 67, 83-87, 92, 93 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo/Bearsley/Vanell or Kondo/Sato/Vanell as

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applied to claims 1, 2, 3, 28, 29, 52, 53, 54, 78, 79, 80 above, and further in view of Berman et al. (US 5,882,251).

Referring to claims 6-10, 15, 16, 32-36, 57-61, 66, 67, 83-87, 92, 93 using polishing pad having grooves are well known to one skilled in the art as a way for slurry distribution and improved pad-wafer contact as shown here by Berman (col. 1, line 33-col. 2, line 20). The grooves intersect the channel on the pad (col. 2, line 5-10). The first grooves are perpendicular to the second grooves (fig. 2).

7. Claims 22, 23, 72-74, 76, 77, 98-102 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo/Bearsley/Vanell or Kondo/Sato/Vanell as applied to claims 21, 52, 72, 78 above, and further in view of admitted prior art.

Unlike claimed invention, Kondo doesn't describe the pressure is from about 0.10-3 or from 0.10-1 psi. He teaches a pressure of 220 g/cm<sup>2</sup> or 3.129 psi and he teaches that the down force is not limited to this (col.12, line 1-3). Furthermore using a pressure such as claimed 0.10-1 psi is well known and practiced by one skilled in the art as shown by the admitted prior art in page 5 in order to avoid disadvantage such as edge effects. Therefore, it would have been obvious to one skilled in the art at the time of the invention use low P such as 0.1-1 psi in order to avoid defects such as edge effects and scratch on the wafer.

Referring to claims 72-74, 98-100, admitted prior art shows that forming structure having less than 0.18 um and using lower dielectric constant material for isolation of these structures are desired to increase performance speed. Therefore, it would be obvious for one skilled in the art

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to apply Kondo's method to form structure having small size such as less than 0.18 um dimensions to produce a faster device.

***Response to Arguments***

8. Vanell doesn't describe heat or cool the slurry prior to distributing the slurry to the contact area is acknowledged. However, he does teach to heat the platen to ensure the chemicals in the slurry have minimum reaction rate when starting a CMP process. Please see col. 10, lines 5-8 in Vanell where he teaches that slurry should be at a predetermined T to ensure chemical in the slurry have a minimum reaction rate when starting a CMP process. This would suggest that the slurry would have to be at a certain T before starting the CMP process. Therefore, it would have been obvious to one skill in the art to heat or cool the T in order to control the slurry T to ensure the chemicals in the slurry having a minimum reaction when starting the CMP process.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD  
January 14, 2004

*DV*